PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	William L. Brenneman Andrew J. Vacco Szuchain F. Chen
Application No.:	10/727,920
Filing Date:	December 4, 2003
Group Art:	1775
Examiner:	Cathy Fong Fong Lam
Title:	PEEL STRENGTH ENHANCEMENT OF COPPER LAMINATES
Attorney Docket:	6113B-000859/US

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLACEMENT APPEAL BRIEF
UNDER 37 C.F.R. § 41.37

Sir:

The Notice of Appeal in this Application was mailed on August 30, 2007. Appellant submits the Replacement Appeal Brief in response to the Notice of Non-Compliant Appeal Brief dated September 29, 2008.

APPELLANT'S BRIEF ON APPEAL

Pursuant to 37 C.F.R. §41.37, Applicants submit their Brief on Appeal, as follows:

REAL PARTY IN INTEREST – UNDER 37 C.F.R. § 41.37(c)(1)(i)

The real party in interest in this appeal are The Olin Corporation, a corporation of the State of Virginia, having its principal place of business at 190 Carondelet Plaza, Suite 1530, Clayton, MO 63105-3443, by virtue of an assignment recorded May 26, 2004 at Reel 015366, Frame 0462.

RELATED APPEALS & INTERFERENCES - UNDER 37 C.F.R. § 41.37(c)(1)(ii)

To the best of Appellants' knowledge, no other appeals or interferences are pending which will directly affect, be directly affected by or have a bearing on the Board's decision in the present pending appeal.

STATUS OF THE CLAIMS – UNDER 37 C.F.R. § 41.37(c)(1)(iii)

Claims 1, 3-6, 8-12 are pending in this application, and were finally rejected in the Office Action of April 30, 2007, and are the subject of this appeal. Claims 2, 7, and 13-28 were cancelled in the Amendment filed February 12, 2007.

- A copy of the claims presently being appealed (i.e., Claims 1, 3-6, 8-12) is provided in the attached Claims Appendix.
- A copy of the Final Office Action mailed April 30, 2007 placing the claims under final rejection is provided in the attached Evidence appendix.

STATUS OF AMENDMENTS – UNDER 37 C.F.R. § 41.37(c)(1)(iv)

A final rejection was mailed April 30, 2007, in response to which a Response After Final was filed July 25, 2007. In response thereto, an Advisory Action was mailed August 2, 2007, which denied entry of the Amendments and maintained the rejection of Claims 1, 3-6, 8-12.

SUMMARY OF THE CLAIMED SUBJECT MATTER – UNDER 37 C.F.R. § 41.37(c)(1)(v)

Claim 1

1. A smooth surface copper foil for lamination to a dielectric substrate, the copper foil comprising:

a peel strength enhancement coating deposited on a smooth surface of the copper foil having an R_z of less than about 1 μm to be laminated to said dielectric substrate, the peel strength enhancement coating consisting essentially of a metal and metal oxide mixture, the metal and metal oxide mixture being formed from one or more of: vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium.

With regard to independent claim 1, paragraph [0025] of the present application as published in 20040166017 states that the term "smooth" means a low profile surface, e.g., less than 1 .mu.m Rz, where Rz is the average of five peak to valley distance measurements as measured using a surface profilometer.

Paragraph [0011] of the present application also states:

[0011] In one aspect of the invention, a peel strength enhancement coating is deposited on a surface of a copper foil, which may be laminated to a dielectric substrate. The peel strength enhancement coating consists essentially of a metal and metal oxide mixture, the metal and metal oxide mixture being formed from one or more of: vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium. Preferably, the metal oxide is selected from one of chromate, tungstate, and molybdate. The surface of the copper foil may be smooth, and the peel strength enhancement coating may have a thickness of between about 20 to about 200 angstroms. Silane may be deposited on the peel strength enhancement coating prior to lamination to the dielectric substrate.

Claim 6

6. An article comprising:

a dielectric substrate;

a copper foil having a smooth surface with an R_z less than about 1μm laminated to the dielectric substrate; and

a peel strength enhancement coating disposed between the smooth surface of the copper foil and the dielectric substrate, said peel strength enhancement coating being a mixture of a metal and a metal oxide with said metal selected from the group consisting of one or more of vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium, wherein the copper foil exhibits less than or equal to 10% loss of peel strength when m4easured in accordance with IPC-TM-650 Method 2.4.8.5 using a 1/8 inch test specimen after being immersed in 4N HCl at 60°C for 6 hours.

With regard to independent claim 6, paragraph [0025] of the present application as published in 20040166017 states that the term "smooth" means a low profile surface, e.g., less than 1 .mu.m Rz, where Rz is the average of five peak to valley distance measurements as measured using a surface profilometer.

Paragraph [0011] also states:

> [0011] In one aspect of the invention, a peel strength enhancement coating is deposited on a surface of a copper foil, which may be laminated to a dielectric substrate. The peel strength enhancement coating consists essentially of a metal and metal oxide mixture, the metal and metal oxide mixture being formed from one or more of: vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium. Preferably, the metal oxide is selected from one of chromate, tungstate, and molybdate. The surface of the copper foil may be smooth, and the peel strength enhancement coating may have a thickness of between about 20 to about 200 angstroms. Silane may be deposited on the peel strength enhancement coating prior to lamination to the dielectric substrate.

Paragraph [0012] of the present application further states:

> [0012] In another aspect of the invention, an article comprises a copper foil having a smooth surface laminated to a dielectric substrate. A peel strength enhancement coating is disposed between the copper foil and the dielectric substrate, and the copper foil exhibits less than or equal to 10% loss of peel strength when measured in accordance with IPC-TM-650 Method 2.4.8.5 using a 1/8 inch test specimen after being immersed in 4N HCl at 60.degree. C. for 6 hours. The peel strength enhancement coating may also exhibit less than or equal to 10% edge undercut after the immersion in 4N HCl at 60.degree. C. for 6 hours. that the copper foil exhibits less than or equal to 10%.

GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL – UNDER 37 C.F.R. § 41.37(c)(1)(vi)

Appellants present the following issue for review:

Is the invention set forth in claims 1, 3-6, 8-12 non-obvious under 35 U.S.C. §103(a) in view of Lin et al. (U.S. Patent No 5,071,520)?

ARGUMENT – UNDER 37 C.F.R. § 41.37(c)(1)(vii)

1. 1st GROUND OF REJECTION ON APPEAL

Pursuant to 37 C.F.R. § 41.37(c)(1)(vii), the following provides the contentions of appellants with respect to the sole ground of rejection above presented for review in accordance with 37 C.F.R. § 41.37(c)(1)(vi).

Independent Claims 1 and 6

The copper foil of claims 1 and 6 are not obvious in view of Lin, because:

1) Lin makes no disclosure of a smooth copper foil, on which a peel strength enhancing coating is applied;
2) Lin only teaches or suggests the application of a treatment coating to a roughened or dendritic treated copper foil;
3) A smooth copper foil would not have been a matter of design choice, since Lin's teachings to provide a roughened/dendritic copper foil to improve peel strength teaches away from smooth copper foils, and would lead one skilled in the art in a direction divergent from the path taken by the Appellant in using a smooth copper foil; and
4) The Appellant's smooth copper foil would not have been "obvious to try" given Lin's teaching towards roughened copper foils for improving peel strength, and the unpredictability associated with chemical processes such as the present application of a coating treatment to a smooth copper foil as described in the Appellant's specification.

I. Independent Claims 1, 6 Are Not Obvious Because Lin Does Not Teach A Smooth Copper Foil That Has A Peel Strength Enhancing Coating Applied Thereon

The Final Office Action states on page 3 that Lin clearly teaches that "the copper foil is a wrought copper foil." The Appellant respectfully disagrees that Lin teaches a smooth copper foil.

The Appellant first notes that while Lin states the copper foil may be a wrought copper foil (Lin '520, col. 3, ln. 16-18), Lin makes no mention of a smooth copper foil, on which an anti-tarnish coating is applied. Rather, Lin states that "The copper foil to be treated may comprise any electro-deposited or wrought copper or copper alloy foil", where the foil is "treated to improve the adhesion properties of the foil." (Lin '520, col. 3, ln. 19-20). Lin further teaches that "it is preferred to electrolytically form a plurality of dendrites on the surface". Lin also states that "U.S. Pat. Nos. 4,468,293 and 4,549,950 to Polan et al. ... illustrate suitable techniques for roughening the copper or copper alloy foil surface." (Lin '520, col. 3, ln. 34-37). No where in Lin is there a disclosure of a smooth copper foil that receives a peel strength enhancing coating treatment.

Specifically, Lin discloses a wrought copper foil that is subjected to a "subsequent roughened treatment" (Lin '520, col. 3, ln. 33), and does not teach or suggest using a smooth copper foil in applying a peel strength enhancement coating thereon. Lin only discloses copper foils that have been subjected to treatments for electrolytically forming dendrites, or techniques for roughening the surface.

On page 3 of the Advisory Action mailed August 2, 2007, the Examiner contends that Lin *does not require* a copper foil with a dendritic treatment, and refers to Examples C and D disclosed in column 5 in Lin '520. The Appellant respectfully disagrees.

In Example C, Lin makes no mention of a smooth copper foil, and only recites an "Electrodeposited copper foil strip similar to Example A", which recites an Electrodeposited copper foil subjected to a dendritic treatment. (Lin '520, col. 3, ln. 33)

In Example D, Lin also makes no mention of a smooth copper foil. Rather, Example D states that an "Electrodeposited copper foil...without the dendritic treatment **was washed and subjected to** an antitarnish treatment in a solution CrO3 / **H2SO4**". (Lin '520, col. 5, ln. 58-61). The Appellant submits that this washing or exposing of the copper foil to Sulfuric Acid would roughen the copper foil, much like Lin's reference to "techniques for roughening the copper" disclosed in U.S. 4,468,293, which teaches the application of sulfuric acid in connection with a copper foil on which dendrites are to be deposited. (Lin, col. 3, ln. 34; citing techniques in 4,468,293, at col. 5, ln. 3-7). Thus, the Appellant submits that the copper foils disclosed in Lin are roughened, and are different from the smooth copper foil in Appellant's claims.

To further support the conclusion that Lin does not teach or suggest using a smooth copper foil in applying a peel strength enhancement coating, the Declaration of Brenneman (included as evidence of what the prior art teaches) establishes that the products of the Lin et al. '520 patent and of the claimed invention are different. Appellants advise that Exhibit 1 photomicrograph show a plurality of white dots disbursed over the surface of the sample that Dr. Brenneman identifies as bumps, which indicates that Lin's teaching provides a roughened copper foil. The Exhibit 2 photomicrograph does not show these dots. Appellant believe that this is representative of the smooth surface of the starting material (R_z less than about 1 μm), that is a feature of the claimed invention and not in the invention disclosed in the Lin et al. '520 patent.

Thus, the Appellant submits that independent claims 1 and 6 are not obvious, because Lin does not disclose or suggest the use of a smooth copper foil surface, for applying a peel strength enhancing coating thereto.

II. Lin Only Teaches Or Suggests The Application Of A Treatment Coating To A Roughened Or Dendritic-Treated Copper Foil

The Final Office Action states on page 3 that "one skilled in the art would choose a surface condition of the copper foil and the thickness...because they are just a matter of design choice". The Appellant respectfully disagrees, since Lin teaches the use of a roughened surface.

Lin specifically states that the foil is "treated to improve the adhesion properties of the foil." (Lin '520, col. 3, ln. 19-20). Lin further teaches that "it is preferred to electrolytically form a plurality of dendrites on the surface", and also that "U.S. Pat. Nos. 4,468,293 and 4,549,950 to Polan et al. ... illustrate suitable techniques for roughening the copper or copper alloy foil surface." (Lin '520, col. 3, ln. 34-37).

Lin also states in column 1 that:

> "To maximize adhesion, it is desirable to roughen the surface of the foil which contacts the dielectric prior to bonding. While there a re a variety of techniques available to roughen or treat the foil, one exemplary technique involves the formation of a plurality of copper or copper oxide dendrites on the foil surface."

Thus, one skilled in the art would not have considered the use of a smooth copper foil with a peel strength enhancing coating to be just a matter of design choice, since one skilled in the art considering the above recitation in Lin would have been led to choose a roughened surface to improve peel strength.

The Appellant submits that Lin discloses either an electrodeposited foil (which by definition provides a rough, not smooth, surface), or rolled foil that has been subjected to roughening treatment. If the device is not inherently rough (e.g. from electrodeposition), then the Lin et al. '520 patent teaches to purposely roughen the surface. [see, Lin, e.g., col. 1, lines. 34-48; col. 2, lines 41-44; col. 3, lines 18-28; col. 3, lines 42-44]. Since the clear teaching of the Lin et al. '520 patent is to use a rough copper surface, the Lin et al. '520 patent does not teach the application of the anti-tarnish treatment to a smooth

surface. Thus, the Lin et al. '520 patent cannot make the claimed invention obvious, since to do so goes against the clear teaches of the Lin et al., '520 patent.

As such, the Appellant submits that independent claims 1 and 6 are not obvious, because Lin does not teach or suggest the use of a smooth copper foil surface, for applying a peel strength enhancing coating thereon.

III. Lin's Teaching Of A Roughened Copper Foil To Maximize Adhesion Teaches Away From The Use Of Smooth Copper Foil With Coating Treatments

Lin's disclosure of a foil "treated to improve the adhesion properties of the foil", and preference to "electrolytically form a plurality of dendrites on the surface" or use "suitable techniques for roughening the copper" (see Lin '520, col. 3, ln. 19-26), teaches away from the use of smooth copper foils. Lin also states In column 1 that:

> "To maximize adhesion, it is desirable to roughen the surface of the foil which contacts the dielectric prior to bonding. While there a re a variety of techniques available to roughen or treat the foil, one exemplary technique involves the formation of a plurality of copper or copper oxide dendrites on the foil surface."

Thus, one skilled in the art would not have considered the use of a smooth copper foil with a peel strength enhancing coating, since one skilled in the art considering the above recitation in Lin would have been led in a direction divergent from the path taken by Appellant in using a smooth copper foil. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be led in a direction divergent from the path that was taken by the Appellant, or the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the Appellant. *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994). Thus, the Appellant submits that claims 1 and 6 are not obvious in view of Lin, which only discloses roughened surfaces and teaches away from the use of smooth surfaces.

IV. It Would Not Have Been "Obvious To Try" A Smooth Copper Foil, Given Lin's Teaching To Roughen The Surface Of The Foil To Maximize Adhesion

The Appellant's smooth copper foil would not have been "obvious to try", given Lin's teaching towards roughened copper foils for maximizing adhesion and improving peel strength. (Lin, col. 1, ln. 34-37). Moreover, the unpredictability associated with chemical processes, such as the application of treatment coatings to smooth copper foils, would not have made the use of the claimed smooth copper foil obvious to one skilled in the art. As described in paragraph [0053] of the Appellant's specification:

> "Comparative sample 2 was manufactured using a smooth copper foil subjected to the P2 treatment only. Peel strength testing of comparative sample 2 revealed a peel strength of about 1.6 lbs/inch. Comparative sample 2 delaminated (zero peel strength) after only 1 hour of exposure to the HCL solution."

With regard to the P2 treatment above, the present application states that:

> "The tarnish resistance of a copper foil may be enhanced by applying a thin (can be on the atomic scale) coating that contains co-deposited ions of zinc and chromium. This treatment, referred to as the p2 treatment, is disclosed in U.S. Pat. No. 5,022,968."

The above P2 treatment for co-depositing ions of zinc and chromium is also disclosed in Lin et al. '520. When such coatings as taught in Lin '968 and Lin '520 are applied to a smooth copper foil, the foil results in poor peel strength. Thus, the Appellant submits that it would not have been "obvious to try" using a smooth copper foil with a treatment coating, as chemical processes do not necessarily achieve predictable results.

However, according to the Appellant's disclosure, "a smooth copper foil can have a peel strength substantially equal to that obtained using a conventional, rough-surfaced foil." (see paragraph [0057] of the present application). Table 1 of the Appellant's application contrasts the low 1.6 lb. per inch peel strength of a comparative sample 2 (made from a smooth copper foil with a P2 treatment as in Lin), with the 5.3 – 5.5 lb/inch peel strength of the exemplary foil of the Appellant's invention.

The Final Office Action further contends on page 3 that the present specification states the peel resistant coating of the present invention could be applied to copper foils with any surface finish. However, while the peel resistant coating could be used for rough coatings, Appellant's claims 1 and 6 recite a smooth copper foil. The specification states that the peel strength enhancement coating is particularly useful with smooth copper foil. (see ¶ [0025] of the present application). This is critical to electrical performance requirements of the copper foil for high frequency applications where roughened copper foil is restricted. (see ¶ [0025] of the present application).

Given Lin's teaching towards roughened copper foils for maximizing adhesion, the Appellant submits that Lin teaches away from using smooth copper foils, and that it would not have been "obvious to try" using a smooth copper foil with a treatment coating, given that chemical processes for applying coating treatments to smooth copper foils do not necessarily achieve predictable results. As such, the Appellant submits that claims 1 and 6 are not obvious.

Dependent Claims 3 and 8

With regard to the subject matter of claims 3 and 8, the claimed peel strength enhancement coating is structurally different from and distinguished over Lin's anti-tarnish coatings. Lin discloses various solutions for providing an anti-tarnish treatment, including an aqueous chromic acid-phosphoric acid solution, an aqueous chromic acid-sulfuric acid solution, and electrolytically depositing chromium and zinc ions on the foil by immersion in an electrolyte solution consisting of a hydroxide solution such as a hexavalent chromium compound. Hexavalent chromium compounds are those which contain the element chromium in the +6 oxidation state [Cr(VI)], which have octahedral coordination. (Advanced Inorganic Chemistry, 5th ed, Cotton/Wilkinson). The Appellant submits that Lin's disclosed aqueous chromic-phosphoric acid solution, aqueous

chromic-sulfuric acid solution, and electrolytically deposited chromium ions only result in the deposition of chromium ions, and create coatings that are structurally different from that claimed by the Appellant.

Contrary to the teachings of Lin, claims 3 and 8 recite a metal selected from the group consisting of chromate, tungstate or molybdate (see ¶ 43 of present application). The present application states in ¶ [0042] that surface treatment 2 uses "an aqueous solution containing polyatomic anions that contain oxygen (oxyanions) formed from a metal selected from groups 5B, 6B, and 7B of the period table of the elements...the oxyanion containing the largest number of anions is most preferred (i.e., the "ate" ", where "Group 6B includes chromium, molybdenum, and tungsten". (see ¶ [0042]). An oxyanion is a polyatomic anion that contains oxygen, which can include a terminal metal element. In an aqueous solution, chromate and dichromate anions are in chemical equilibrium, depending on PH level:

$2\ CrO_4^{2-} + 2\ H_3O^+ \rightleftharpoons Cr_2O_7^{2-} + 3\ H_2O$ (Advanced Inorganic Chemistry, 5th ed, Cotton).

The Appellant notes that polyatomic anions containing oxyanions formed from a metal such as chromate is structurally different from the chromic acids in solution with phosphoric acid, sulfuric acid, or others disclosed in Lin. Lin's reference to a hexavalent chromium compound only refers to the ionic structure of the chromium, and none of the chromic acid solutions disclosed in Lin teach the structure of oxygen and chromium together in oxyanions formed from a metal such as chromate. The Appellant submits that this structural difference in solution results in the application of a coating unlike Lin, formed from the structurally different polyatomic anion form of chromate. The Appellant submits that the claimed coating formed from a solution structurally different from Lin cannot resemble the anti-tarnish treatment in Lin, in further view of the difference in the claimed copper foil's properties and characteristics, as pointed out below.

As the Office Action states, Lin discloses an anti-tarnish treatment that comprises deposition of chromium and zinc ions, (Col. 4, lines 13-15), which treatment the present application refers to in ¶ [0009] as a P2 treatement forming a tarnish resistance "coating that contains co-deposited ions of zinc and chromium". The present application further notes that with "(surface treatment 2) testing has shown that this treatment results in a reduction in both the percent edge undercut and the percent peel strength loss...when compared to prior art anti-tarnish coatings", such as the comparative sample 2 in Table 1 and comparative sample 7 in Table 2 which have a P2 anti-tarnish coating with chromium and zinc ions as disclosed in Lin. (see present application ¶ [0060], Table 1 and Table 2). Appellant notes that "each of the samples in Table 2 was prepared using smooth 5μm copper foil". (See present application ¶ [0065]).

Relative to comparative samples of copper foil treated with the containing a P2 anti-tarnish coating with chromium and zinc ions as disclosed in Lin, copper foils treated with chromate as in exemplary sample 5 and exemplary sample 10 possessed greater peel strength properties than the comparative samples treated with chromium ions. (See Table 1 and Table 2 of the present application). The present application states in ¶ [0043] that "in a preferred composition, the electrolytic solution contains chromate, tungstate, or molybdate. The Appellant submits that the claimed coating formed from a solution containing a polyatomic anion form of chromate that is structurally different from the solutions in Lin cannot resemble the anti-tarnish coatings in Lin, since they do not possess the same properties or characteristics. The Federal Circuit has held that where the claimed and prior art products are alleged to have identical compositions, the prima facie case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. *MPEP 2112*; *In re Best*, 195 USPQ at 433 (Fed. Cir. 1990). Here, testing disclosed in the present application has shown that smooth cooper foil having the anti-tarnish treatment disclosed in Lin

does not necessarily possess the characteristics of enhanced peel strength provided by the claimed enhanced peel strength coating (surface coating 2) of the present application, as pointed out below.

The present application discloses testing that shows the unexpected results for a smooth copper foil having the claimed coating that achieves the same bond or peel strength of the roughened copper foil with anti-tarnish treatment, as disclosed in Lin. The Appellant submits that the claimed coating cannot resemble that disclosed in Lin, based on the present application's disclosure of "Comparative Sample 2 manufactured using a smooth copper foil subjected to the P2 treatment" for deposition of chromium and zinc ions as taught in Lin. This comparative sample 2 made with a smooth copper foil having a treatment as taught in Lin resulted in a peel strength of only 1.6 lbs/inch, where the smooth copper foil having the claimed coating resulted in a peel strength of about 5.5 lbs/inch.

Accordingly, the Appellant submits that the claimed coating cannot resemble that disclosed in Lin, since the claimed coating formed from a solution containing a polyatomic anion form of chromate that is structurally different from the solutions in Lin. As such, the Appellant submits that claims 3 and 8 are also not obvious.

CONCLUSION

Appellant respectfully submits that the Examiner has not shown that claims 1, 3-6, 8-12 are obvious in view of Lin et al. (U.S. Patent No 5,071,520). Accordingly, reversal of the rejections of Claims 1, 3-6, 8-12 is respectfully requested.

Respectfully submitted,

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CLAIMS APPENDIX
UNDER 37 C.F.R. § 41.37(c)(1)(viii)

1. A smooth surface copper foil for lamination to a dielectric substrate, the copper foil comprising:

a peel strength enhancement coating deposited on a smooth surface of the copper foil having an R_z of less than about 1 μm to be laminated to said dielectric substrate, the peel strength enhancement coating consisting essentially of a metal and metal oxide mixture, the metal and metal oxide mixture being formed from one or more of: vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium.

2. (cancelled)

3. The copper foil of claim 1, wherein the metal oxide is selected from the group consisting of chromate, tungstate and molybdate.

4. The copper foil of claim 1, wherein the peel strength enhancement coating has a thickness of between about 20 to about 200 angstroms.

5. The copper foil of claim 1, wherein silane is deposited on the peel strength enhancement coating prior to lamination to the dielectric substrate.

6. An article comprising:

a dielectric substrate;

a copper foil having a smooth surface with an R_z less than about 1μm laminated to the dielectric substrate; and

a peel strength enhancement coating disposed between the smooth surface of the copper foil and the dielectric substrate, said peel strength enhancement coating being a mixture of a metal and a metal oxide with said metal selected from the group consisting of one or more of vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, and rhenium, wherein the copper foil exhibits less

than or equal to 10% loss of peel strength when m4easured in accordance with IPC-TM-650 Method 2.4.8.5 using a 1/8 inch test specimen after being immersed in 4N HCl at 60°C for 6 hours.

7. (canceled)

8. The article of claim 6, wherein the metal oxide is selected from the group consisting of chromate, tungstate and molybdate.

9. The article of claim 6, wherein the peel strength enhancement coating has a thickness of between about 20 to about 200 angstroms.

10. The article of claim 6, wherein the peel strength enhancement coating exhibits less than or equal to 10% edge undercut after the immersion in 4N HC1 at 60°C for 6 hours.

11. The article of claim 6, wherein the copper foil exhibits less than or equal to about 7% loss of peel strength when measured in accordance with IPC-TM-650 method 2.4.8.5 using a 1/8 inch test specimen after being immersed in 4N HC1 at 60°C for 6 hours.

12. The article of claim 6, wherein silane is deposited on the peel strength enhancement coating prior to lamination to the dielectric substrate.

Claims 13 – 28 (Canceled)

EVIDENCE APPENDIX – UNDER 37 C.F.R. § 41.37(c)(1)(ix)

- A copy of the Final Office Action mailed April 30, 2007 placing the present application under final rejection is provided.
- A copy of the Declaration/Affidavit previously submitted by William L. Brenneman on November 18, 2005, is provided.

RELATED PROCEEDINGS APPENDIX - UNDER 37 C.F.R. § 41.37(c)(1)(x)

NONE.